# Installing Linux on Compaq ProLiant Servers

**The Compaq ProLiant Linux Team** **January 22, 2001**

*This guide was designed to facilitate the installation of various Linux distributions on Compaq ProLiant Servers.*

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Installing and Running Linux on Compaq ProLiant Servers How-To
Solution Guide prepared by Compaq ProLiant Linux Team

Sixth Edition (January 22, 2001)

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# 1. Introduction

Compaq ProLiant servers provide an excellent platform for Linux. These machines are engineered from the ground up to provide performance, reliability, and scalability using the best industry-standard components. This guide provides additional details for installing Linux on Compaq ProLiant servers.

Compaq recognizes the many distributions of Linux available. This guide is geared for the four distributions officially supported by Compaq at this time: Caldera 2.3, Red Hat 6.2 and Red Hat 7.0, TurboLinux 6.0 and TurboLinux 6.05, and SuSE 6.3 and SuSE 7.0.

# 1.1 Compaq Hardware

Compaq supports many Intel and Alpha based platforms for Linux. The current list of supported Intel based servers is shown below. Even if your Compaq server is not listed here, you should benefit from the information in this guide. For more details on the tested and certified Compaq servers, see our website at http://www.compaq.com/linux.

## Compaq Servers

The following list represents the Compaq hardware this guide primarily targets (although other Compaq servers share similar components and could work as well). All servers listed below are the base models and do not include any options. Base model descriptions can be found at http://www.compaq.com/products/servers/linux.

ProLiant DL320
ProLiant DL360
ProLiant DL380
ProLiant DL580
ProLiant ML330
ProLiant ML350
ProLiant ML350 1GHz
ProLiant ML370
ProLiant ML530
ProLiant ML570
ProSignia 200
Prosignia Server 720
Prosignia Server 740
ProLiant 400
ProLiant 800
ProLiant 1600
ProLiant 1850R
ProLiant 3000
ProLiant 5500
ProLiant 6000
ProLiant 6400R
ProLiant 6500
ProLiant 7000
ProLiant 8000
ProLiant 8500

### Compaq Storage Controllers

The Wide Ultra2 SCSI or Wide Ultra2 SCSI-3 Controller series are based on Symbios Logic (LSI Logic) chips, while the Wide-Ultra3 SCSI controllers are based on Adaptec technology. These are both supported under Linux. The Linux kernel includes driver support for the Compaq Smart Array Controller family.

### Network Interface Controllers (NICs)

Compaq servers ship with one or more NICs that employ the Intel EtherExpress Pro/100 (based on the Intel 82558 or 82559 chips). The first driver available for this chipset is the eepro100 driver provided by SCYLD. Intel now provides their own e100 linux driver as well. Older Compaq servers use with NetFlex-2 or NetFlex-3 NICs based on the Texas Instruments ThunderLAN (or TLAN) chip and use the TLAN driver.

## 1.2 Compaq Configuration Software

As an added feature, the Compaq System Partition reserves an area of the boot disk to store configuration utilities that simplify server deployment and the OS installation process. The System Configuration Utility installs in this partition and provides system configuration capabilities and server diagnostic tools. Although not required, Compaq recommends that you create and maintain this partition to make future system configuration sessions quick and easy.

# 2. Preparing for Linux Installation

Most distributions of Linux can be installed on Compaq servers without much difficulty. However, many newer Compaq servers utilize a more efficient peer PCI bus architecture that the PCI discovery code in Linux (*pci.c*) does not comprehend. Consequently, the entire secondary PCI bus is not discovered during boot up. More recent distributions of Linux (for example, Red Hat 6.2) have corrected this problem. This section addresses that problem for those distributions that do not discover the peer PCI bus architecture.

# 2.1 Kernel

## Peer Bus Architecture

As previously noted, many Compaq servers use a peer PCI bus architecture. In this design, two or more PCI buses use multiple PCI host bridges to connect to the processor bus. The Linux 2.2 kernel (prior to version 2.2.14) discovers PCI slots starting at the first PCI host bridge (also called the primary PCI bus), and then discovers additional bridged PCI devices (installed in slots). Since the kernel does not comprehend multiple PCI host bridges, any PCI adapters or devices connected to peer PCI host bridges are not discovered. Therefore, these devices become unavailable to the operating system unless the kernel is patched. Linux kernels, beginning with version 2.2.14 (such as the kernel in Red Hat 6.2), have been updated to properly discover all PCI devices located on peer PCI buses.

**Note:** This issue is not specific to Compaq, and affects any server implementing a dual peer PCI bus architecture.

A list of Compaq servers with multiple PCI buses, showing the slots on the primary PCI bus follows.

- Prosignia Server 740: Slot #1, 2
- Prosignia Server 720: Slot #2, 3, 4, 5
- ProLiant DL360: Slot #2 (**Note**: Integrated Dual Compaq NC3163 NICs are on the secondary peer PCI bus)
- ProLiant DL380: Slot #1
- ProLiant DL580: Slot #6
- ProLiant ML330: Slot #3, 4, 5, 6
- ProLiant ML350: Slot #1, 4, 5, 6
- ProLiant ML350 1GHz: Slot #1, 4, 5, 6
- ProLiant ML370: Slot #1, 2
- ProLiant ML530: Slot #1
- ProLiant ML570: Slot #6
- ProLiant 800: Slot #1, 2
- ProLiant 1600: Slot #4, 5, 6
- ProLiant 1850R: Slot #1, 2, 3, 4
- ProLiant 3000: Slot #1, 2, 3, 4
- ProLiant 5500: Slot #6, 7
- ProLiant 6000: Slot #2, 3
- ProLiant 6400R: Slot #5, 6
- ProLiant 6500: Slot #5, 6
- ProLiant 7000: Slot #2, 3
- ProLiant 8000: Slot #1, 2, 3, 4
- ProLiant 8500: Slot #7, 8, 9

## Kernel Patch

If the Linux kernel on the distribution cannot detect devices or adapters on the secondary PCI bus, it cannot function until the kernel is patched.

For Red Hat 6.1, Compaq provides a boot and install kernel you can use to detect the devices or adapter on the secondary PCI bus. Download the SoftPaq called *Compaq Kernel Patch for Red Hat 6.1*, SP10776 (tar file format) or SP10775 (exe format), from http://www.compaq.com/products/servers/linux/linux-drivers.html or http://www.compaq.com/support/files/server/us. The SoftPaq includes the source code to patch *pci.c* so it correctly discovers all PCI buses in the system.

For TurboLinux 6.0, Compaq provides a boot and install kernel you can use to detect the devices or adapter on the secondary PCI bus. Download the SoftPaq called *Peer-Bus for 2.2.X Linux Kernel*, SP13121, from http://www.compaq.com/products/servers/linux/linux-drivers.html or http://www.compaq.com/support/files/server/us. This SoftPaq includes the source code to patch *peerbus.patch* so it correctly discovers all PCI buses in the system. See section 5.6 for instructions to patch the Peer-Bus for 2.2.X Linux Kernel and rebuild the kernel.

**Note:** This SoftPaq works with any Linux system using the 2.2 kernel.

For Caldera OpenServer 2.3, Caldera now provides an updated installation diskette plus an updated kernel. The software and documentation can be found at Caldera:
ftp://ftp.calderasystems.com/pub/updates/eServer/2.3/launch/floppy/README.peerbus-243
ftp://ftp.calderasystems.com/pub/updates/eServer/2.3/launch/floppy/install.144.peerbus-243
ftp.calderasystems.com//pub/updates/eServer/2.3/018/README
ftp.calderasystems.com//pub/updates/eServer/2.3/018/RPMS

**Note:** The installation instructions for Caldera in this HowTo do not cover the updates from Caldera. Please consult the *README* files from the Caldera ftp site mentioned above.

**Note:** Any distribution using kernel 2.2.16 (i.e. Red Hat 7.0), or later, should correctly work with a peer bus architecture.

# 2.2 Driver Caveats

## SYMBIOS 53C1510 chip set

Some Compaq servers use a newer Symbios (now LSI Logic) SCSI chip, the SYM53C1510, an extension of the 53C8xx series. Although Linux supports this type of controller, you need to ensure that the updated SYM53c8xx driver is included in the distribution that you are installing. For example, Red Hat 6.1 does not support this controller. Consider using Red Hat 6.2 (or a later version) or performing an Expert Install and providing the driver when prompted during the installation process. A driver diskette for this controller is available as a SoftPaq (SP 13102 (tar file) or SP 13120 (exe file)) through http://www.compaq.com/products/servers/linux/linux-drivers.html or http://www.compaq.com/support/files/server/us.

## ATI Rage IIC Console Driver

Many Linux distributions may have some ghosting problems with XFree86 on the integrated ATI Rage IIC video controller. The problem stems from enabling the ATI Mach64 console driver that interferes with the XFree86 Mach64 driver. The problem can be severe depending on the video mode chosen. Red Hat distributions do not have this issue.

If you see this condition (machines with the Rage IIC and more than 4MB of video RAM are most suspect), eliminate it by creating a new Linux kernel with the ATI Mach64 console driver disabled and then booting from this new kernel.

# 2.3 Boot Manager

## Copy System Configuration Partition

Here are some things to remember when disk partitioning.

1. The Compaq System Partition is not required to install Linux. Compaq recommends you create the partition to facilitate system configuration. If you choose not to create or keep this partition, use floppy disks to complete the configuration process.

2. When using a Smart Array hosted disk system, avoid installing Linux with drives in the array that are not configured. Drives should be either configured or removed until the installation completes. Compaq Array Controllers are configured using the ACU (Array Configuration Utility) which is available on the SmartStart CD-ROM.

3. Four primary partitions are allowed on each hard drive.

4. An extended partition counts as one primary partition. An extended partition can have multiple logical drives within itself.

5. Most OSes can only boot from a primary partition. A logical drive within an extended partition is normally not bootable. Many find that this is not a problem with Linux but it is important to note when setting up multiple OSes on a single system.

6. The boot kernel must reside completely below the 1024 cylinder limit. If the kernel is placed beyond the 1024 cylinder limit, the operating system will not boot.

## Sample Partition Sizes

These suggested partition sizes could be used as guidelines for your Linux installation.

- Primary Partition #1 (**Note:** This partition normally shows up as Partition #3)
    - Description: Compaq System Partition
    - Size: 39 MB
    - Type: Compaq Diagnostics (0x12)
- Primary Partition #2 (**Note:** This needs to be marked active)
    - Description: Linux Boot Partition
    - Size: 30 MB or more (depending on how many kernel images you want to host)
    - Type: Linux
- Primary Partition #3 (Optional for dual boot, if you want to have another OS)
    - Description: Other OS Boot Partition
    - Size: In accordance with the requirements for your secondary OS.
    - Type: Choose type depending on OS
    - Note: When creating non-Linux partitions, it is best to use a version of FDISK native to the other OS. The recommended method would be to create this partition as a placeholder with the Linux FDISK, and then delete and recreate this partition using the other OS's version of FDISK.

- Extended Partition #4
    - Description: Hosts various logical drives and swap partition
    - Size: Remainder of hard drive
    - Logical Drive #1
        - Description: Swap Partition
        - Type: Swap (0x82)
        - Size: 2 * amount of RAM or larger (about 130 MB)
    - Logical Drive #2
        - Description: / partition (Linux root file system)
        - Type: Linux
        - Size: 265 MB or larger
    - Logical Drive #3 (optional)
        - Description: /var partition (Linux log area)
        - Type: Linux
        - Size: 265MB
    - Logical Drive #4 (optional)
        - Description: /home partition (user directories)
        - Type: Linux
        - Size: Variable, about 1/2 the remaining capacity of the hard drive
    - Logical Drive #5 (optional)
        - Description: /usr partition (shared software among users)
        - Type: Linux
        - Size: Variable, about 1/2 the remaining capacity of the hard drive

## Notes

Usually the remaining drive space divides equally between /home and /usr, thus 50%. For Red Hat, /usr should at least be 900MB since it holds all your programs and applications. Other Linux distributions could vary.

Create a 30MB to 60MB partition for /boot. This should be more than enough, but it allows for kernel growth or multiple kernels and boot environments.

By default, the Compaq System Partition will generally show up as partition #3 instead of partition #1. This is no cause for alarm and this partition should always be preserved.

Other disk managers such as NT Disk Administrator renumber the partitions so that #3 (The F10 partition) becomes #1, #1 becomes #2, and #2 becomes #3. Care should be taken when allowing other partition managers to run. If the partitions do get renumbered, then it is a matter of gaining access to */etc/fstab*, making adjustments so that Linux knows the new partition number layout, making adjustments in */etc/lilo.conf*, and finally running */sbin/lilo*. Then Linux should come back up.

The Extended Partition can be used to hold other dual boot OS logical drives. This will allow more drive space to be allocated to the various platforms.

Linux kernel 2.2 and above supports up to 2 GB of swap space per swap partition. To get more, simply create and mkswap additional swap partitions, and add the appropriate entries into */etc/fstab*. Most distributions will do this automatically if more than one partition is labeled 0x82 (Linux Swap).

## Notes on /boot

**Systems with the F10 partition:**

If your Compaq server makes use of the Compaq F10 Partition, here is the recommended method of installation:

- /boot should be a primary partition (partition # 1-4). /boot should not be a logical drive (partition #5 or higher).
- /boot should be marked active.
- /boot needs to be below the 1024 cylinder limit (it is preferred to have /boot immediately following the Compaq F10 Partition).
- LILO should be installed to the /boot partition and not to the MBR.

If LILO is installed to the MBR, then an entry can be made in */etc/lilo.conf* in order to access the F10 partition; however, this is not the recommend location for installing LILO.

**Systems without the F10 partition and have the F10 BIOS (RBSU) instead:**

- /boot can be either a primary partition or logical drive (logical drives reside in the extended partition).
- /boot will not need to be marked active. Logical drives may not be marked active.

- /boot will need to be below the 1024 cylinder limit (it is preferred to have /boot at the front of the drive).
- LILO should be installed to the MBR.

### Distributions

Not all distributions automatically partition the hard drive according to the guidelines above. Multiple primary partitions (hidden system partitions, Windows partitions, etc.) may confuse some utilities. If the boot partition is a logical drive (in the extended partition), the system cannot boot without special care. To access Linux, LILO will need to be installed into the MBR, an alternate boot manager used, or a Linux boot floppy will need to be used.

With many recent distributions, the Disk Druid Utility partitions the hard drive. Many also offer the FDISK Utility (or CFDISK Utility) to perform this function; it provides more control over the procedure. Red Hat 6.2, and later, moved the FDISK Utility to the Expert Installation, which should be selected in order to partition the hard drive using the methods described here.

**Note:** Disk Druid from Red Hat 6.1 does not properly allow you to create /boot as a primary partition. /boot will have to be created using FDISK in order to make it a primary partition. In Red Hat 6.2 and other newer distributions, Disk Druid has been altered so that if you create /boot as the very first partition, it creates as a primary partition.

## 2.4 Hardware

### Memory

#### Installing with more than 1 GB of memory

On a 2.2 kernel, the Linux installation fails if more than 1 GB of memory is installed. If you wish to install with more than 1 GB, limit the amount that the install process sees by typing linux mem=960M at the boot prompt. In order to use more than 1 GB of memory after installing Linux, a new kernel must be built with a specified upper limit of 2 GB. Memory above 2 GB requires extensive modification to the kernel source tree.

**Note:** This issue is not unique to Compaq servers. It applies to all servers with more than 1 GB of memory.

#### Using more than 16 MB of memory

On some older Compaq servers, the Linux installation procedure may only detect 16 MB of memory. The installation can be restarted, if necessary, and the correct amount of memory can be specified at the boot prompt by typing mem=*X*M where *X* is the correct amount of memory on the system. If Linux detects only 16 MB of memory, the installation will proceed at a much slower pace than normal.

To avoid having to type this command every time you boot Linux, edit the */etc/lilo.conf* file and add an Append Line. It looks like this:

```
append="mem=48M"
```

and goes just before the Read-Only Line. The section of */etc/lilo.conf* will look similar to the following:

```
image=/boot/vmlinuz-2.2.5-15

        label=linux

        root=/dev/sda2

        append="mem=48M"

        read-only
```

Save */etc/lilo.conf* and then run */sbin/lilo* to install a fresh copy of LILO.

# 3. Installation Process

This section outlines several installation procedures for various Linux distributions.

## 3.1 SmartStart

The Compaq SmartStart for Servers tool configures Compaq hardware, loads optimized drivers, and assists with software installation. It also provides functionality for integrating operating systems on Compaq servers to achieve optimum reliability and performance. Integration Management features extend the benefits of SmartStart and facilitate consistency and reliability of server deployment and maintenance.

Compaq recommends that you begin with SmartStart when installing Linux on a ProLiant system. Always try to use the latest version of SmartStart with your installation. Currently, SmartStart only supports manual path installation of Linux. The following steps are based on SmartStart Release 4.90.

1. Start with a System Erase. Starting with a system erase ensures you begin the installation process from a known non-configured state.
    a) Boot from the SmartStart CD-ROM.
    b) Select **Run System Erase Utility** from the Main Menu → **Yes**.
    c) Restart the server.

2. Begin the installation process.
    a) Select the language and locale settings.
    b) Select **Manual Installation → Begin**.
    c) Select **Linux** in the Operating System Selection Screen.
    *When using SmartStart 4.60 or earlier select* **UnixWare2.**

    SmartStart configures your server hardware including options, such as an array controller, if present. SmartStart also creates the Compaq System Partition and installs the System Partition files.
3. Restart the server.
4. Set the Compaq Array Configuration (if applicable) using the Array Configuration Utility (ACU).
5. Continue until the screen prompts you for the appropriate OS media.
6. Insert the Linux installation CD-ROM (and floppy if necessary) and press **Enter**. The system will now boot of the Linux installation disk.
7. Proceed with Linux Installation.

**See instructions for specific distributions below.**

# 3.2 Caldera

# eServer 2.3.1

## Hardware

The following installation instructions apply to the servers listed. Servers marked with a number have special instructions described further below.

ProLiant DL320(3)
ProLiant DL360(2)
ProLiant DL380
ProLiant DL580
ProLiant ML330
ProLiant ML350
ProLiant ML350 1GHz
ProLiant ML370
ProLiant ML530(1)
ProLiant ML570
ProLiant 1600
ProLiant 1850R(1)
ProLiant 3000
ProLiant 5500
ProLiant 6000
ProLiant 6400R
ProLiant 7000
ProLiant 8000
ProLiant 8500

# Installation

## Important!

Caldera eServer 2.3.1 is maintenance release that is available directly from Caldera at www.calderasystems.com.

***Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.***

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
   ***See section 3.1 for SmartStart setup.***
2. Insert the Caldera eServer 2.3.1 CD when prompted.
3. Select **Custom (Expert Only!)** at the Installation Target screen.
   This allows you to keep Compaq System Partition. The Compaq System Partition is not required to install Linux. Compaq recommends you create the partition to facilitate system configuration. The partition contains SmartStart diagnostic tools and is also required to run the tools off the SmartStart CD. If you choose not to create or keep this partition, floppy disks containing the utilities may be made from the SmartStart CD-ROM. Please consult the SmartStart documentation for further information. If you choose not to keep the Compaq System Partition, it is not necessary to select the **Custom (Expert Only!)** installation.
4. Partition the hard drive:

**DO NOT edit or delete the Compaq System Partition.**
***See section 2.3 for tips on disk partitioning.***
**Note:** Testers have found that this utility does not properly set up logical drives on some systems, so we recommend that you do not use logical drives if you are having problems with this distribution.

a) Create the **/** (root) partition first. (example: */dev/sda1*)
   Make sure that the end cylinder number is less than 1024.
   Make sure that the **Bootable** and **Format** boxes are selected.
   Write down the / (root) partition device number. You may need the root partition device number for later use.
b) Create the swap partition:
   Select **Linux Swap** from the Partition Type Section.
   *Usually size of swap is 2X the system RAM (2 GB max!)*
   **Note***:* Do not create a /boot partition.

5. Save the partition configuration by selecting **Write** option.
6. Format the chosen partitions.
7. Select the installation packages.
8. Set up the network.
9. Select **Install LILO** on TARGET Partition (example */dev/sda1*) at the Linux Loader screen to preserve the Compaq System Partition.

**Note:** If you put LILO into the MBR, you will be unable to access the Compaq System Configuration Utilities by pressing **F10** during system boot up (unless your system has ROM-based utilities). If LILO is placed on the /boot partition and that partition marked active, the **F10** key functions properly. If you prefer to put LILO in the master boot record, you can set up LILO such that it will boot the Compaq partition using LILO mechanisms instead of the **F10** key.
**Important**: For 'ROM Based Setup Utility' (RBSU) units (such as the ProLiant ML330, ProLiant ML350 and ProLiant DL320), install LILO into the MBR.

10. Log on to the server after the installation completes.
11. Open a terminal emulation window.
12. Modify the */etc/lilo.conf* file, add the keyword linear below the prompt line, and save the file.
    **Note**: If using an integrated array controller on a DL360 see note (3) below.
    **Important**: The sever will fail to reboot if you fail to modify the *lilo.conf* file.
13. Type lilo at the prompt.
14. Reboot the server.

## Special Instructions:

(1) **ProLiant 1850R**

- Follow step #1 through #5 above.
- Type install no linear at the initial boot**:** prompt**.**
  If you do not type install no linear, Caldera will not install.
- Continue with steps #6 through #17.
- Skip step #18.
- Continue with steps #19 and #20.

(2) **ProLiant DL360**

- Follow step #1 through #18 above.
- Make sure that *lilo.conf* has the correct drive parameters displayed for boot=/dev/ida/c0d0p# (where # is the actual partition number). This is the information from step 7.a. above.
- Under the 'image=' section, the root parameter should look like: root=/dev/ida/c0d0p# (where # is the actual partition number of the root directory).
- Under the 'root=…' enter in the following line:
  initrd = /boot/initrd-2.2.14.gz
- Continue with steps #19 and #20

(3) **ProLiant DL 320**

**SCSI model**:

- Follow steps #1 through #20 above.

**ATA model**:

- Download the SoftPaq 14366, Caldera Bootable Diskette, available at http://www.compaq.com/support/files/server/us to a Linux or UNIX server.
- Create a Caldera Bootable Diskette from the downloaded image. Refer to the *README* file in the downloaded SoftPaq for instructions to create a boot disk.
- Run SmartStart on the server: Erase Utility → Manual → Linux OS.
- Insert the SoftPaq 14366 Caldera bootable diskette and the Caldera eServer 2.3.1 CD when prompted.
- At the initial boot prompt type:
  - linux10 for the 10GB ATA-100 drive model
    **- OR -**
  - linux20 for the 20GB ATA-100 drive model
    **- OR -**
  - For all other ATA drives, type: linux hde="cylinder, head, sector" (example, linux hde=2586,240,63).

  **Note:** The cylinder = Addressable Sectors / 240 / 63

  **Note:** These commands allow Caldera kernel to detect the ATA drive size properly.
- Continue with step #3.
- For the DL320, delete the Compaq System Partition (created by SmartStart) prior to create Linux partition.
- Continue with step #5.

# eServer 2.3

## Hardware

The following installation instructions apply to the servers listed. Servers marked with a number have special instructions described further below.

ProLiant DL320(4)
ProLiant DL360(3)
ProLiant DL380
ProLiant DL580
ProLiant ML330
ProLiant ML350
ProLiant ML350 1GHz
ProLiant ML370
ProLiant ML530(1)
ProLiant ML570
ProLiant 1600
ProLiant 1850R(2)
ProLiant 3000
ProLiant 5500
ProLiant 6000
ProLiant 6400R
ProLiant 7000
ProLiant 8000(1)
ProLiant 8500(1)

# Installation

## Important!

Please read section 2.1 regarding the Linux kernel and the peer bus architecture before installing Caldera eServer 2.3. The kernel cannot detect devices or adapters on the secondary PCI bus and they cannot function until you patch the kernel. This includes some integrated devices, such as the ProLiant DL360 integrated NICs. Caldera now provides an updated installation diskette plus an updated kernel. The software and documentation can be found at Caldera:
ftp://ftp.calderasystems.com/pub/updates/eServer/2.3/launch/floppy/README.peerbus-243
ftp://ftp.calderasystems.com/pub/updates/eServer/2.3/launch/floppy/install.144.peerbus-243
ftp.calderasystems.com//pub/updates/eServer/2.3/018/README
ftp.calderasystems.com//pub/updates/eServer/2.3/018/RPMS

***Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.***

15. Download the updated installation diskette provided by Caldera: ftp://ftp.calderasystems.com/pub/updates/eServer/2.3/launch/floppy/install.144.peerbus-243
16. Make a bootable floppy from the downloaded image:
    Example: `dd if =install.144.peerbus-243 of=/def/fd0 bs=18k`
    **Note:** This command must be executed on a UNIX or Linux system. You may also do a *RAWRITE.EXE* on Microsoft platforms.
17. Download the updated kernel provided by Caldera available at ftp.calderasystems.com//pub/updates/eServer/2.3/018/RPMS/linux-kernel-binary-2.2.14-3S.i386.rpm to a system that is on your local network. You will need this file for later use.
    **Note:** You may download this file directly later if you will have a direct connection to the Internet.
18. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
    ***See section 3.1 for SmartStart setup.***
19. Insert the peer bus bootable diskette and Caldera eServer 2.3 when prompted.
20. Select **Custom (Expert Only!)** at the Installation Target screen.
    This allows you to keep Compaq System Partition. The Compaq System Partition is not required to install Linux. Compaq recommends you create the partition to facilitate system configuration. The partition contains SmartStart diagnostic tools and is also required to run the tools off the SmartStart CD. If you choose not to create or keep this partition, floppy disks containing the utilities may be made from the SmartStart CD-ROM. Please consult the SmartStart documentation for further information. If you choose not to keep the Compaq System Partition, it is not necessary to select the **Custom (Expert Only!)** installation.
21. Partition the hard drive:

**DO NOT edit or delete the Compaq System Partition.**
***See section 2.3 for tips on disk partitioning.***
**Note:** Testers have found that this utility does not properly set up logical drives on some systems, so we recommend that you do not use logical drives if you are having problems with this distribution.

c) Create the / (root) partition first. (example: */dev/sda1*)
Make sure that the end cylinder number is less than 1024.
Make sure that the **Bootable** and **Format** boxes are selected.
Write down the / (root) partition device number. You may need the root partition device number for later use.

d) Create the swap partition:
Select **Linux Swap** from the Partition Type Section.
*Usually size of swap is 2X the system RAM (2 GB max!)*
**Note***:* Do not create a /boot partition.

22. Save the partition configuration by selecting **Write** option.
23. Format the chosen partitions.
24. Select the installation packages.
25. Set up the network.
26. Select **Install LILO** on TARGET Partition (example */dev/sda1*) at the Linux Loader screen to preserve the Compaq System Partition.
    **Note:** If you put LILO into the MBR, you will be unable to access the Compaq System Configuration Utilities by pressing **F10** during system boot up (unless your system has ROM-based utilities). If LILO is placed on the /boot partition and that partition marked active, the **F10** key functions properly. If you prefer to put LILO in the master boot record, you can set up LILO such that it will boot the Compaq partition using LILO mechanisms instead of the **F10** key.
    **Important**: For 'ROM Based Setup Utility' (RBSU) units (such as the ProLiant ML330, ProLiant ML350 and ProLiant DL320), install LILO into the MBR.
27. Log on to the server after the installation completes.
28. Open a terminal emulation window.
29. Ftp to a server that contains new kernel images from Caldera: (from step #3)
    Example:
    ftp ftp.calderasystems.com//pub/updates/eServer/2.3/018/RPMS/linux-kernel-binary-2.2.14-3S.i386.rpm
30. Download all of the new RPM.
31. Install the new kernel: rpm –Fhv linux-*.i386.rpm
32. Modify the */etc/lilo.conf* file, add the keyword linear below the prompt line, and save the file.
    **Note**: If using an integrated array controller on a DL360 see note (3) below.
    **Important**: The sever will fail to reboot if you fail to modify the *lilo.conf* file.
33. Type lilo at the prompt.
34. Reboot the server.

Special Instructions:

(1) **ProLiant ML 530, ProLiant 8000,** and **ProLiant 8500**

- You must add the SCSI or Array Controller to a primary PCI bus slot to install Caldera eServer 2.3. The servers have the SCSI/Array Controllers on the secondary PCI bus and the Caldera eServer 2.3 kernel does not detect PCI devices on the secondary/tertiary PCI bus.

NOTE: This shouldn't be necessary when using the installation disk provided by Caldera, but is still recommended as a precaution.

(2) **ProLiant 1850R**

- Follow step #1 through #5 above.
- Type install no linear at the initial boot**:** prompt**.**
  If you do not type install no linear, Caldera will not install.
- Continue with steps #6 through #17.
- Skip step #18.
- Continue with steps #19 and #20.

(3) **ProLiant DL360**

- Follow step #1 through #18 above.
- Make sure that *lilo.conf* has the correct drive parameters displayed for boot=/dev/ida/c0d0p# (where # is the actual partition number). This is the information from step 7.a. above.
- Under the 'image=' section, the root parameter should look like: root=/dev/ida/c0d0p# (where # is the actual partition number of the root directory).
- Under the 'root=…' enter in the following line:
  initrd = /boot/initrd-2.2.14.gz
- Continue with steps #19 and #20

(4) **ProLiant DL 320**

**SCSI model**:

- Follow steps #1 through #20 above.

**ATA model**:

- Download the SoftPaq 14366, Caldera Bootable Diskette, available at http://www.compaq.com/support/files/server/us to a Linux or UNIX server.
- Create a Caldera Bootable Diskette from the downloaded image. Refer to the *README* file in the downloaded SoftPaq for instructions to create a boot disk.
- Run SmartStart on the server: Erase Utility → Manual → Linux OS.
- Insert the SoftPaq 14366 Caldera bootable diskette and the Caldera eServer 2.3 CD when prompted.

- At the initial boot prompt type:
  - linux10 for the 10GB ATA-100 drive model
    **- OR -**
  - linux20 for the 20GB ATA-100 drive model
    **- OR -**
  - For all other ATA drives, type: linux hde="cylinder, head, sector" (example, linux hde=2586,240,63).

  **Note:** The cylinder = Addressable Sectors / 240 / 63

  **Note:** These commands allow Caldera kernel to detect the ATA drive size properly.
- Continue with step #6.
- For the DL320, delete the Compaq System Partition (created by SmartStart) prior to create Linux partition.
- Continue with step #8.

# 3.3 Red Hat 6.2 and 7.0

## Hardware

These installation instructions apply to the listed servers

| | |
|---|---|
| ProLiant DL320 | ProLiant 400 |
| ProLiant DL360 | ProLiant 800 |
| ProLiant DL380 | ProLiant 1600 |
| ProLiant DL580 | ProLiant 1850R |
| ProLiant ML330 | ProLiant 3000 |
| ProLiant ML350 | ProLiant 5500 |
| ProLiant ML350 1GHz | ProLiant 6000 |
| ProLiant ML370 | ProLiant 6400R |
| ProLiant ML530 | ProLiant 6500 |
| ProLiant ML570 | ProLiant 7000 |
| ProSignia 200 | ProLiant 8000 |
| Prosignia Server 720 | ProLiant 8500 |
| Prosignia Server 740 | |

## Installation

***Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.***

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
   *See section 3.1 for SmartStart setup.*
2. Insert the Red Hat CD-ROM when prompted.
3. Select **Custom** in the Install Type Screen

**This allows you to keep Compaq System Partition.**

4. Partition the hard drive(s):

**DO NOT edit or delete the Compaq System Partition.**

***See section 5 for more information***

   a) Create the /boot partition first in the Disk Druid Screen.
      This is usually 30 to 60 MB; make sure that the end cylinder number is less than 1024.
   b) Create the swap partition:
      Select **Linux Swap** from the Partition Type Section.
      Usually size of swap is 2X the system RAM (2 GB max!)
   c) Create the **/** partition (root partition).
      You may select the option **Grow to fill disk?** for the **/** partition to utilize the remaining disk space.
      Write down the / (root) partition device number. Example, *sdaX* where *X* is the partition device number.

   **Important:** You may need the root partition device number for later use.

5. Select to install the LILO boot record on "***/dev/…* first sector of boot partition**" at the LILO Configuration Screen.
6. Select **Test this Configuration** at the X Configuration Screen.
7. Create a boot disk when prompted (you might need it later).
8. Reboot the server after the installation completes.

**Note:** For a list of known problems and their solutions, check Red Hat's errata for updates, http://www.redhat.com/errata.

# 3.4 TurboLinux 6.0.5

## Hardware

These installation instructions apply to the listed servers. Servers marked with a number have special instructions described further below.

ProLiant DL320
ProLiant DL360
ProLiant DL380
ProLiant DL580
ProLiant ML330
ProLiant ML350(2)
ProLiant ML350 1GHz
ProLiant ML370
ProLiant ML530
ProLiant ML570
ProLiant 1600
ProLiant 1850R
ProLiant 3000(1)
ProLiant 5500
ProLiant 6000
ProLiant 6400R(3)
ProLiant 7000
ProLiant 8000
ProLiant 8500

## Installation

***Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.***

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
   *See section 3.1 for SmartStart setup.*
2. Insert the TurboLinux 6.0.5 CD-ROM, or later, when prompted.
3. Select **Auto Probe for Hardware Devices** to assist you with what hardware modules to load.
4. Create the partitions using CFDISK or FDISK.
   DO NOT edit or delete the Compaq System Partition.
   a) Create the **/** (root) partition first.
   b) Make the / partition bootable.
   c) Create a primary partition for Linux Swap partition.
5. Save the partition configuration by selecting the **Write** option.
6. Format the partitions.
7. Setup the network.
8. Select the installation packages.
   a) Select **First Sector of the Boot Partition** at the LILO installation screen to preserve the Compaq System Partition.
   b) Select **Auto Probe** for the video card.
   This assists you with which video driver to load.
   c) Select the video card discovered by Auto Probe.
9. Select **Do It Later** at Finish X Configuration Screen because it could lock up your system if a wrong video driver is chosen.
10. Use the Turboxcfg or Xconfigurator Utility to setup X after you have rebooted your system.
11. Remove the TurboLinux CD-ROM and reboot the server once the installation completes.

## Special Instructions:

(1) **ProLiant 3000**

- You must have the 12/30/99 ROM or later installed before the Linux installation.

(2) **ProLiant ML350** servers:

- Follow steps #1 through #7 above.
- Select **Serial** at the Service Status Board Screen.
- Disable the serial service.
- Continue with steps #8 through #11.

(3) **ProLiant 6400R**

- Follow steps #1 through #7 above.
- Select **Default Kernel (386 or newer)** at the Select a Kernel Screen.
  The machine may not boot if the 586 or 686 kernel is selected.
- Continue with steps #8 through #11.

# 3.5 SuSE

# SuSE 7.0

## Hardware

These installation instructions apply to the listed servers. Servers marked with a number have special instructions described further below.

| | |
|---|---|
| ProLiant DL320(1) | ProLiant ML350 |
| ProLiant DL360 | ProLiant ML350 1GHz |
| ProLiant DL380 | ProLiant ML370 |
| ProLiant DL580 | ProLiant ML530 |
| ProLiant ML330 | ProLiant ML570 |

## Installation

***Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.***

1. Erase Utility → Manual → Linux OS.
   See section 3.1 for SmartStart setup.
2. Insert the SuSE 7.0 CD-ROM #1 when prompted.
3. Select Language/ Keyboard/Time zone.
4. Select Custom Partitioning – For Experts.
5. Create the partitions:
   a) Create the /boot partition first (+30M -primary).
   b) Create the / swap partition (+500M).
   c) Create the / (root) partition (-rest).
   **DO NOT edit or delete the Compaq System Partition.**
6. Select the installation packages.
7. Select **Custom** LILO Installation.
8. Select **Write LILO to the /boot partition.**
9. Check **Use linear option.**

Special Instructions:

(1) **ProLiant DL320**:
**SCSI model:**

- Follow steps #1 - # 9 above.

**ATA model**:

- Follow steps #1 through #2 above.

- For the 10GB ATA-100 drive model:
  Type linux hde=1292,240,63 at the initial boot**:** prompt.
  **Note:** You have about 2 seconds to start entering the command before installation automatically begins. This command allows SuSE kernel to recognize the ATA drive size properly. For the SCSI model, no parameters are needed.

  **- OR –**

- For the 20GB ATA-100 drive model:
  Type linux hde=2586,240,63 at the initial boot**:** prompt.

- Continue with steps #3 through #9.

# SuSE6.3

## Hardware

These installation instructions apply to the listed servers. Servers marked with a number have special instructions as described further below.

| | |
|---|---|
| ProLiant DL320(3) | ProLiant 800 (1) |
| ProLiant DL360 | ProLiant 1600 (1) |
| ProLiant DL380 | ProLiant 1850R |
| ProLiant DL580 | ProLiant 3000 |
| ProLiant ML330 | ProLiant 5500 |
| ProLiant ML350 | ProLiant 6000 |
| ProLiant ML350 1GHz(2) | ProLiant 6400R |
| ProLiant ML370 | ProLiant 7000 |
| ProLiant ML530 | ProLiant 8000 |
| ProLiant ML570 | ProLiant 8500 |

## Installation

***Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.***

1. Erase Utility → Manual → Linux OS.
   a) See section 3.1 for SmartStart setup.
   b) Insert the SuSE 6.3 CD-ROM #2 when prompted.

2. Type linux pci=irqrt at initial **boot:** prompt.
   **Important:** You have about 2 seconds to start entering the command below before installation begins automatically. This command allows SuSE 6.4 kernel to detect the SCSI/Array Controller on secondary PCI bus.
3. Select **Load SCSI Modules** to load the SCSI driver, then select NCR **53c8XX.**

If the SCSI driver fails to install:

a) Select **More Modules**.
b) Insert the SuSE 6.4 Modules diskette.
c) Select **Compaq Smart Array Controller or SYM896** for the latest Compaq Array and SCSI controller support.
   **(2) Note:** For the ML 350 1GHz select the AIC7XXX Adaptec controller.
d) Press **Enter** when prompted to enter the parameter for SCSI.

4. (Optional) Select **Load network card module** to load a NIC driver → Select Intel EtherExpress Pro100.
   If the NIC driver fails to install:
   a) Select **More Modules.**
   b) Insert the SuSE 6.4 Modules diskette.
   c) Select **Compaq Netelligent 10/100 NIC** for the latest Compaq NIC driver.
      **(1) Note:** You must install the Compaq Netelligent 10/100 NIC (TLAN) driver for ProLiant 800 and ProLiant 1600.
   d) Press **Enter** when prompted to enter the parameter for the NIC.
   e) Go to Main Menu by selecting **Back.**
5. Select **Start Installation / System**.
6. Select **Start Installation / Update**.
7. Select the version of YaST to use for the installation screen→ select **YaST1 – Text based**.
8. Select **Install Linux from Scratch** at Type of Installation Screen.
9. Select **Partitioning** at Partition Hard Drive Screen.

**DO NOT edit or delete the Compaq System Partition.**

***See section 5 for more information***

a) Create the **/boot** partition first.
   This is usually 30 to 60 MB; make sure that the end cylinder number is less than 1024.
b) Create the **swap** partition:
   Select **Linux Swap** from the Partition Type Section.
   Usually size of swap is 2X the system RAM (2 GB max!)
c) Create the **/** partition (root partition).
   Write down the / (root) partition device number. Example, *sdaX* where *X* is the partition device number.

**Important:** You may need the root partition device number for later use.

10. Select **Start installation** at the Installation Screen.
11. Select **Main Menu** after the installation completes.
12. Select **Boot sector of the /boot partition** to configure the Linux loader, check the **Linear** option, and generate the boot configuration by pressing **F4=New Config**.
13. Reboot the server after the installation completes.

(3) **ProLiant DL320**:

**SCSI model:**

- Follow steps #1 - #13 above.

**ATA model**:

- Follow step #1 above.

For the 10GB ATA-100 drive model:

- Type linux hde=1292,240,63 pci=irqrt at the initial boot**:** prompt.
  **Note:** You have about 2 seconds to start entering the command before installation automatically begins. This command allows SuSE kernel to recognize the ATA drive size properly and also to detect the SCSI/Array Controller on secondary PCI bus.

  **- OR -**

For the 20GB ATA-100 drive model:

- Type linux hde=2586,240,63 pci=irqrt at the initial boot**:** prompt.

  **- OR –**

For all other ATA-100 drive models:

- Type linux hde="cylinder, head, sector" pci=irqrt (example, linux hde=1956,240,63 pci=irqrt) at the boot: prompt.
  **Note:** The cylinder = Addressable Sectors / 240 / 63

- Continue with steps #3 through #12.
- Modify the */etc/lilo.conf* file before rebooting the server by changing the line boot=/dev/... to boot=/dev/hde and save the file.

  **Important:** The server will reboot to "Missing Operating System" error message if you fail to modify the *lilo.conf* file.

- Type **lilo** at the prompt.
- Reboot the server.

# 4. Troubleshooting

## 4.1 Problems During Installation

### Problem: Kernel panic occurs during installation

### Possible Causes:

1. More than 960MB of memory in the server
2. Drives on the array not configured

### Possible Solutions:

1. Verify that Linux uses less than 960MB of memory in the server.
2. Verify that all drives attached to the drive array controller are properly configured.

### Problem: No storage controller is recognized

### Possible Causes:

1. More recent driver needed for the controller (SYM53C8xx)
2. The embedded or stand-up storage controller interfaces to a secondary/tertiary PCI bus and the Linux distribution kernel is less than 2.2.16

### Possible Solutions:

1. Download a more recent driver for the controller.
2. Use a Linux distribution with kernel 2.2.16 or later.
3. Follow the installation procedure.

## 4.2 Problems Booting

### Problem: Linux hangs during boot when starting networking

### Possible Cause:

Bugs in eepro100 driver

## Possible Solutions:

1. Try using the e100.0 device driver available from Intel, http://www.intel.com/support/network/adapter/pro100/100Linux.htm:

2. Go to the SCYLD site for up to date eepro100 driver information, http://www.scyld.com/network/eepro100.html:
   The EEPro100 Mailing List archive is also another good source of information. http://www.tux.org/hypermail/linux-eepro100/

## Problem: LILO or Linux hangs during boot

## Possible Causes:

1. /boot above the 1024 cylinder limit
2. Problem with */etc/lilo.conf*
3. Problem with */etc/fstab*
4. Linear addressing for SCSI drives

## Possible Solutions:

1. Use FDISK to make sure the /boot partition is one of the first partitions on the drive and that it does not extend beyond cylinder 1024.
2. Rerun */sbin/lilo*. Put LILO into the Master Boot Record (MBR). This means omitting any digits at the end of the first line.
3. Verify that all the information in */etc/fstab* is correct.
4. Boot to the floppy created during installation. Add the keyword Linear to the */etc/lilo.conf* file or run */sbin/lilo –l*.

## Problem: Black screen after POST (Power-On-Self-Test) completes (blinking cursor in the upper left-hand corner)

## Possible Causes:

1. No active partition
2. /boot in the extended partition
3. Master Boot Record (MBR) corrupt
4. Problem with */etc/lilo.conf*
5. LILO not stamped in linear mode

## Possible Solutions:

1. Verify that there is an active partition.
2. Verify that /boot partition number is less than 5.
3. Repair the Master Boot Record with DOS 6.22 or the Windows 95 boot disk using the FDISK /mbr command.
4. Put LILO into the Master Boot Record. This means omitting any digits at the end of the first line.
5. Edit your */etc/lilo.conf* file if you are installing to a ProLiant ML330 or ProLiant ML350 and LILO is stamped on the master boot record. Make sure that the keyword Linear appears in the top section.

## Problem: Linux does not report the correct amount of system memory

## Possible Causes:

1. Memory not specified in */etc/lilo.conf*
2. Kernel not compiled to recognize all of physical memory

## Possible Solutions:

1. Add the following line to your */etc/lilo.conf* just before the read-only line (adjust for your amount of memory), and re-run LILO to make this change take effect:

   append="mem=48M" or append="mem=49152k"

2. Check memory settings by changing the present working directory to */usr/src/linux* and typing make config, make menuconfig, or if X is running, make xconfig, as appropriate. It may be necessary to apply the bigmem patch (this patch is included in Red Hat 7.0) to recognize greater than two gigabytes of physical RAM.

# 4.3 Other Issues

## F10 Access to the Compaq System Configuration Utility is missing

The ability to access the system partition by pressing **F10** at startup is controlled by the Master Boot Record. If you overwrite the MBR with LILO, you will not be able to access the system partition by pressing **F10** on startup. This option is also not available if the partition does not exist. Here are the steps to recover **F10** functionality.

1. Make sure you have a verified backup and have your boot diskettes available. This procedure is not destructive to data, but a backup is recommended when modifying the MBR.

2. Configure LILO to install to /boot instead of the MBR:

   - Make reference of your /boot partition (*boot=/dev/sda1*) in */etc/lilo.conf* instead of the MBR (*boot=/dev/sda*) by adding the partition number to the device name. (**Note**: Here we reference the /boot partition by its specific partition number; therefore, we do not point to the MBR)

   - Point to your / (root) partition If /boot is not in its own partition.

   - Verify that *image=/boot/vmlinuz-2.2.5-15*points to a valid kernel name, and that *root=/dev/ida/c0d0p6* points to the actual / or root partition.

   - Save your changes.

   - Run */sbin/lilo*. This stamps the boot record and makes your changes take effect.

3. Ensure the /boot partition is active by running FDISK, and check that the /boot partition is the only partition marked active.

4. Restore **F10** functionality by booting with a DOS or Windows diskette and running *fdisk /mbr*. This restores the MBR and allows access to the system partition (This applies to servers that do not use the linear mode of */etc/lilo.conf*).

Now you should be able to access the system partition by pressing **F10** during POST. In addition, you should be able to boot back to Linux by just booting the server (and not pressing any keys). If you are unable to boot to Linux, see the section "LILO is corrupt".

# LILO is corrupt

This section discusses three methods for recovering your system if LILO no longer points to your root and /boot partitions. The recovery process involves using a Linux boot diskette or the Linux installation CD-ROM, mounting the root and /boot partitions, correcting the */etc/lilo.conf* and */etc/fstab* files, and running */sbin/lilo*. You may find that */usr/sbin/chroot* helps during this process.

## Recovering LILO from within Linux

If you are forced to boot Linux from a diskette, repair LILO:

1. Boot Linux.
2. Edit the */etc/lilo.conf* and */etc/fstab* files.
3. Run */sbin/lilo* to repair the copy of LILO on the /boot partition.
4. Verify that the /boot partition is the only active partition and is a primary partition.

## Recovering LILO using a boot and root diskette

1. Boot the server using the Linux Boot Disk \ created during the installation process.
2. Type rescue at the lilo: prompt.
3. Insert the rescue diskette (which was created from the images directory on the Linux Installation CD-ROM) when prompted.

In one of the directories (probably /dev or /tmp), you will find device nodes which point to your hard drive and partitions.

4. Make a mount point

```
> mkdir /mnt
> mkdir /mnt/drive
```

5. Mount your root partition.

```
> mount /dev/sda6 /mnt/drive
```

6. Mount your /boot partition.

```
> mount /dev/sda2 /mnt/drive/boot
```

7. Run chroot to /mnt/drive.

```
> /mnt/drive/usr/sbin/chroot /mnt/drive
> cd /
```

You can print your partitions in FDISK to see what numbers you should be using in */etc/lilo.conf* and */etc/fstab* files.

8. Edit your */etc/lilo.conf* and */etc/fstab* and make sure you have the correct partition numbers.

9. Save your files *(/etc/lilo.conf* and */etc/fstab*).

10. Generate a fresh copy of LILO. (Using the verbose mode may be helpful: /sbin/lilo -v)

```
> /sbin/lilo
```

11. Exit from your chroot shell.

```
> exit
> cd /
```

12. Unmount your boot and root partitions.

```
> cd /
> umount /mnt/drive/boot
> umount /mnt/drive
```

13. Remove any bootable CD or floppy disks and reboot (**CTRL+ALT+DEL**).

Your Linux server should reboot using the hard drive.

### Unable to dual boot server with both Windows NT and Linux

If the server has been configured as a dual boot system with Linux and Windows NT, running Windows NT Disk Administrator causes the partition numbers to change. To correct this problem:

1. Boot the server using a Linux boot disk or CD-ROM.
2. Stamp a new boot record.
3. Modify the */etc/fstab* file to point to the correct partition numbers.

See also http://www.linuxdoc.org/HOWTO/mini/Linux+NT-Loader.html for further info on dual booting Linux and Windows NT.

# 5. Further Reading

## 5.1 Understanding Linux Partition Names and Device Names

Partition names consist of a device name, device number, and partition number. Here are some examples:

Device + Dev. # + Part. # = Full device name

/dev/sd + a + 2 = /dev/sda2 = 2nd primary partition on 1st SCSI disk drive

/dev/sd + a + none = /dev/sda = 1st SCSI disk drive

/dev/hd + c + none = /dev/hdc = MBR on 3rd IDE device

/dev/ida/ + cx + dy + pz = controller ***x*** on logical drive ***y*** with a partition number of ***z***.

Primary partitions are numbered from 1 to 4. An extended partition takes up one primary partition number. Logical drives in the extended partition always start at 5 and go up.

LILO can load most operating systems including the Compaq System Partition. To boot to another partition you should add a section similar to the following:

```
other=/dev/sda3

label=F10

table=/dev/sda
```

- The first line–other=/dev/sda3–should point to the partition to boot.
- The second line–label=F10–shows up when you press **Tab** at the LILO prompt.
- The third line–table=/dev/sda–needs to point to the MBR of the above named partition.

Changes in */etc/lilo.conf* should be saved and */sbin/lilo* run. You should be able to boot to your other choice by typing the appropriate label at the lilo: prompt. Press the **Tab** or **?** to see your choices.

# 5.2 Creating and Adding New Partitions:

Use FDISK to create your new partition: For example - *fdisk /dev/ida/c0d0.* For this example, your new partition name is */dev/ida/c0d0p10* because partition 10 is the next available partition.

1. Create your file system.

```
mkfs -V -t ext2 -c -v /dev/ida/c0d0p10
```

2. Edit your *fstab* to add a line for your partition and a mount point.

See the */mynewprtn* line below which was added in using */dev/ida/c0d0p10* as an example.

```
- - - - - contents of /etc/fstab - - - - - begin

/dev/ida/c0d0p6 / ext2 defaults 1 1

/dev/ida/c0d0p1 /boot ext2 defaults 1 2

/dev/ida/c0d0p9 /home ext2 defaults 1 2

/dev/ida/c0d0p8 /usr ext2 defaults 1 2

/dev/ida/c0d0p7 /var ext2 defaults 1 2

/dev/ida/c0d0p10 /mynewprtn ext2 defaults 1 2

/dev/ida/c0d0p5 swap swap defaults 0 0

/dev/fd0 /mnt/floppy ext2 noauto 0 0

/dev/cdrom /mnt/cdrom iso9660 noauto,ro 0 0

none /proc proc defaults 0 0
```

none /dev/pts devpts mode=0622 0 0

- - - - - contents of */etc/fstab* - - - - - end

3. Make a blank directory in the root directory for a mount point.

```
mkdir/mynewprtn
```

4. Mount the partition or reboot.

```
mount -t ext2 /dev/ida/c0d0p10 /mynewprtn
```

# 5.3 Questions and Answers:

## Compaq Related

### Where can I get more information on Compaq and Linux?

The Compaq Linux website hosts an array of information, such as the distributions Compaq supports, along with white papers, customers advisories, support matrixes, and a direct link to all Linux SoftPaqs for servers and storage options, http://www.compaq.com/products/servers/linux/

### Why start with a system erase?

Starting with a system erase ensures you begin the installation process from a known non-configured state.

### How do I perform a system erase?

Boot from the Smart Start CD-ROM and choose System Erase from the Main Menu.

### How do I get to the main menu of SmartStart if all that shows is a boot: instead of the graphical menu when booting to the SmartStart CD?

One method is to build and use the System Erase Diskette. Create this diskette from the Compaq Disk Builder by inserting the Smart Start CD-ROM into a system running Microsoft Windows; the Autorun feature automatically starts the Disk Builder Program.

### Why choose UnixWare 2 as the operating system to install?

For SmartStart version 4.6 or later, select Linux as the operating system to install. Earlier versions of SmartStart did not include Linux as an operating system option. In this case, the UnixWare 2 setting configures the server's hardware (including chipset-level settings such as the APIC mode) in a manner appropriate for Linux.

## Why choose Expert Install when installing Red Hat or Caldera Linux?

Expert Install allows you to keep an existing Compaq System Partition, while Server Install or Workstation Install options delete the System Partition.

## Why use FDISK instead of Disk Druid when installing older versions of Red Hat Linux?

Once Disk Druid (from Red Hat 6.1) sees a primary partition, it creates all remaining partitions within a non-bootable extended partition. Since this version of Disk Druid does not take into account the Compaq System Partition, it will incorrectly install /boot into the extended partition. You cannot boot from the extended partition. The only way to correctly partition the primary hard disk is to use FDISK. Disk Druid from Red Hat 6.2 has been corrected in Red Hat 6.2 as long as /boot is the first partition created.

## Why put LILO on the first sector of the /boot partition instead of the MBR?

If you put LILO into the MBR, you will not be able to access the System Configuration Utilities by pressing **F10** during system boot up. If LILO is placed on the /boot partition and marked active, the **F10** key functions properly.

**Note:** If you prefer to put LILO in the master boot record, you can set up LILO such that it will boot the Compaq partition using LILO mechanisms instead of the **F10** key.

## Why put the /boot partition immediately after the Compaq System Partition?

This keeps the /boot partition completely below the 1024 cylinder limit.

## How do you verify that the SCSI controllers have been identified?

Use the **LEFT ALT+F3** and **LEFT ALT+F4** buttons to change screen views.

- If a SMART Array controller is installed, these screens indicate the controller was found. The Compaq System Partition appears as partition three (ida/c0d0: p3).

  Compaq Smart2 Driver (v 0.9.9)

  Found 1 controller(s)

  Finding drives on ida0 (SMART-221)

  ida/c0d0: blksz=512 nr_blks=4096320

  ida/c0d0: p3

- If you have an embedded SCSI controller, you should see an indication that it has been found:

sym53c8xx: .....

OR

ncr53c8xx: .....

## 5.4 FDISK tutorial

Some are confused by Linux FDISK. In reality, FDISK is simple. Here are some FDISK commands:

- **A** marks a partition as active (do not mark more than one partition active at any time)
- **D** deletes a partition that you no longer need.
- **M** is your help key, it lists a menu of actions you can perform.
- **N** creates new partitions
- **P** indicates what your partitions look like. Use P frequently to make sure that your partitions are sized correctly.
- **Q** exits without saving your changes
- **T** changes the type of partition. Use this to change your swap partition to type Linux Swap.
- **W** saves your changes.

Partition Types:

- 0x5 is an extended partition.
- 0x12 is a Compaq System Utilities partition.
- 0x82 is Linux Swap file partition.
- 0x83 is Linux ext2 file system partition.

Unless you alter the partition types (not recommended), the only partition type you must change is the swap partition. Change the swap partition to type Linux Swap (type 0x82).

Creating Primary Partitions:

1. Type **N** for new partition.
2. Type **P** for primary.
3. Select the next available primary partition # (1-4).
4. Select the given starting cylinder.
5. Type in the desired size of the partition (for example: +30M for 30MB partition).

Creating Extended Partitions:

1. Type **N** for new partition.
2. Type **E** for extended partition.
3. Select the next available primary partition # (1-4).
4. Select the given starting cylinder.
5. Type in the last cylinder available (it is best for the extended partition to go all the way to the end of the drive).

Note that the Extended Partition shows up as type 5 (extended).

Creating a Logical Drive in the Extended Partition:

1. Type **N** for new partition.
2. Type **L** for logical partition.
3. Select the given starting cylinder.
4. Type in the desired partition size (for example: +265M for 265MB partition).

Note that the Logical Drives start at partition number 5 and go up.

Make sure to mark a partition for /boot as the only bootable partition using the **A** command in FDISK. Make sure to change the type of your swap partition to type swap (82) using the **T** command in FDISK. Save your changes in FDISK by using the **W** command.

## Partitioning your Hard Drives with FDISK

We will now go through the command line driven utility FDISK to create partitions.

1. Type **P** to get a listing of your current partitions.

   You should see a /tmp/ida/c0d0p3 with an ID of 12, your Compaq System Partition. Leave this partition alone.

2. Create the /boot partition.

   This partition will be primary, active, from 30MB to 100MB (choose 60MB for now).

   - Type **N** to create a new partition.
   - Type **P** for primary.
   - Select #1 (the first available partition number).
   - Type in the first available cylinder (in this case 10).
   - Type in +60M to make this a 60MB partition.
   - Type **P** to get a partition listing.
   - Type **A** to make this partition active→ **1** (to make partition #1 active) → **P** (to list your partitions).

   There should only be one partition with a star under the boot column.

   n → p → 1 → 10 → +60M → p

   a → 1 → p

3. Make the extended partition:

   - Type **N** (new) → **E** (extended) → **2** (next available partition #).
   - Type the next available cylinder number (ours is 26).
   - Enter the last available cylinder number (ours is 502).
   - Type **P** to list your partitions.

     n → e → 2 → 26 → 502 → p

4. Create the swap partition:

   - Type **N** (new) → **L** (logical).
   - Select the next available cylinder # (ours is 26).
   - Type in your size (this example uses +128M here since it is limited on space).
   - Type **P** to list your partitions.
   - Type **T** (to change the type) → **5** (to select your swap partition) → **82** (to change to type swap).
   - Type **P** to print and review your partitions.

n → l → 26 → +128M → p

t → 5 → 82 → p

5. Create the root (/) partition:
   - Type **N** (new) → **L** (logical).
   - Select the next available cylinder # (ours is 59).
   - Type in your size (we chose 256MB for the root partition).
   - Type **P** to list your partitions.

     n → l → 59 → +256M → p

6. Create the /var partition:
   - Type **N** (new) → **L** (logical).
   - Select the next available cylinder # (ours is 124).
   - Type in your size (we chose 256MB for the /var partition).
   - Type **P** to review your partitions.

     n → l → 124 → +256M → p

7. Create the /home partition:
   - Type **N** (new) → **L** (logical).
   - Select the next available cylinder # (ours is 189).

   This example puts 50% for /home and 50% for /usr, to calculate this: 502 (ending cylinder) - 189 (starting cylinder = 313; 313/2=156.5; 156+189=345. We used 345 for the ending cylinder.

   - Type **P** to review your partitions.

     n → l → 189 → 345 → p

8. Create the /usr partition.
   - Type **N** (new) → **L** (logical).
   - Select the next available cylinder (example is 346).
   - Select the last cylinder (ours is 502).

This example used 50% of free space for /home and 50% for /usr.

- Type **P** to review your partitions.

  n → l → 346 → 502 → p

9. Double check that your swap partition (probably partition # 5) is set for type "swap."
10. Make sure that /boot is active.
11. Type **W** to write your changes to the hard drives.
12. Select Done to continue with installation.

# 5.5 Configuration File Examples

- Multiple NICs (3 NE-2000's, Red Hat5.2 Linux):

  - - - - - contents of */etc/conf.modules* - - - - - begin

  alias eth0 ne

  alias eth1 ne

  alias eth2 ne

  options ne io=0x300,0x280,0x240

  - - - - - contents of */etc/conf.modules* - - - - - end

- Multiple NICs (2 TLANs, Red Hat5.2 Linux):

  - - - - - contents of */etc/conf.modules* - - - - - begin

  alias scsi_hostadapter ncr53c8xx

  alias eth0 tlan

  alias eth1 tlan

  - - - - - contents of */etc/conf.modules* - - - - - end

- Adding System Partition to LILO (embedded SCSI):

  - - - - - contents of */etc/lilo.conf* - - - - - start

  boot=/dev/sda1

  map=/boot/map

  install=/boot/boot.b

prompt

timeout=50

image=/boot/vmlinuz-2.0.36-0.7

label=linux

root=/dev/sda6

initrd=/boot/initrd-2.0.36-0.7.img

read-only

other=/dev/sda3

label=scu

table=/dev/sda

- - - - - contents of */etc/lilo.conf* - - - - - end

- Adding System Partition to LILO (Compaq Array Controller):

  - - - - - contents of */etc/lilo.conf* - - - - - start

  boot=/dev/ida/c0d0p1

  map=/boot/map

  install=/boot/boot.b

  prompt

  timeout=50

  image=/boot/vmlinuz-2.2.5-15

  label=linux

  root=/dev/ida/c0d0p6

  initrd=/boot/initrd-2.2.5-15.img

  read-only

  other=/dev/ida/c0d0p3

  label=scu

  table=/dev/ida/c0d0

  - - - - - contents of */etc/lilo.conf* - - - - - end

## 5.6 General Instruction to patch the Peer Bus for 2.2.X Linux Kernel and rebuild the kernel

1. Change directory.

   ```
   cd /usr/src/linux
   ```

2. Mount the floppy drive.

   ```
   mount –t vfat /dev/fd0 /mnt/floppy  ()
   ```

3. Apply patch.

   ```
   patch –p1 </mnt/floppy/peerbus.patch
   ```

4. Rebuild the kernel.

   ```
   make menuconfig or make xconfig or make config
   make dep
   make clean
   make bzImage
   cd arch/i386/boot
   cp bzImage /boot/bzImage
   ```

5. Edit LILO and add the new boot line.

6. Run the LILO command at the boot prompt.

If necessary:

```
make modules
cd /lib/modules
mv 2.2.x.x 2.2.x.x-old
cd 2.2.x.x-old
cd block
insmod loop.o
cd /usr/src/linux
make modules_installmake initrd 2.2.xx
```

# 5.7 Useful Links

## Useful Compaq Links

- http://www.compaq.com/linux: Compaq main Linux page.
- http://www.compaq.com/products/servers/linux/ Compaq ProLiant information page.
- http://www.compaq.com/products/servers/linux/ Compaq direct link to Linux SoftPaqs.
- http://www.compaq.com/products/servers/linux/OSMatrix1.html – Compaq list of supported servers.
- http://www.compaq.com/products/servers/linux/OptionsMatrix.html – Compaq list of support options.
- http://www.compaq.com/alphaserver/linux: Compaq Alpha Server information page
- http://www.alphalinux.org: A web site dedicated to information about Linux and Alpha processor-based computer systems.
- http://forum.compaq.com/mb5/user/main.html: Extremely useful forum for technical support of Compaq products (account required from http://forum.compaq.com)
- http://www.geocities.com/rlcomp_1999: Richard Black, Compaq Technical Support, has done a tremendous job pulling this stuff together.
- http://compaq.com/alphaserver/linux: The Compaq Alpha Server information page
- ftp://ftp.compaq.com/pub/products/drivers/linux/ The Compaq SMART/2 Array Controller device driver site
- http://www.scyld.com/network/eepro100.html: Latest Linux drivers for Compaq Fast Ethernet NICs based on the Intel 82558 or 82559 chips
- http://www.intel.com/support/network/adapter/pro100/100Linux.htm: Archives for the base driver package and for the Advanced Networking Services (ANS) Driver for the Intel® PRO/100 Family of Network Adapters (except Intelligent Server Adapters)
- http://tlan.kernel.dk: Latest Linux drivers for Compaq Fast Ethernet NICs based on the TI ThunderLAN chip

## Useful Linux Links

- http://www.linux.org: Linux Online
- http://www.li.org: Linux International
- http://www.gnu.org: The GNU project
- http://www.fsf.org: The Free Software Foundation
- http://metalab.unc.edu/LDP: The Linux Documentation Project
- http://www.tux.org: Several east coast (U.S.) Linux Users Groups
- http://www.redhat.com: Red Hat Linux distribution
- http://www.suse.com: SuSE Linux distribution
- http://charter.linux.tucows.com/index.html: How-tos, etc.
- http://mirror.ox.ac.uk/rpm2html/ (link doesn't work) If you are looking for rpm, here is a site that has them all.
- http://lxr.linux.no/source/: Linux kernel code browsing
- http://home.xnet.com/~blatura/linapp6.html: Tools and utilities for Linux
- http://www.linux.org.uk/SMP/title.html: Useful information on Symmetric Multi-Processing under Linux
- http://www.phy.duke.edu/brahma/smp-faq: Linux SMP FAQ (mirrored from http://www.irisa.fr/prive/dmentre/smp-faq)
- http://www.cs.cmu.edu/People/AUIS/ftp/web/andrew-home.html: The Andrew Consortium site; you can obtain the Andrew EZ program for viewing Andrew EZ format documents (such as the SMP document posted on the http://www.linux.org.uk site).
- http://www.xfree86.org: The Xfree86 Project. Most Linux distributions (including Caldera, SuSE, and Red Hat) include the free X server developed by this organization.
- http://www.freshmeat.net: A large index of ports of software for Linux and other platforms; if you are looking for a particular utility or program, try looking here first.
- http://www.slashdot.org: A useful site for daily news

## 5.8 Feedback

If you have feedback on ways to improve this document, technical corrections, or additional information that should be included, please email the Compaq ProLiant Linux team at linux.feedback@compaq.com

This email address is for feedback only; issues requiring technical assistance should be directed to Compaq Technical Support at support@compaq.com

Visit the Compaq Linux web site at http://www.compaq.com/linux